Quantifying potential economic benefits of incorporating gridded fuel moisture and weather data into wildland fire decision support in the Northern Rocky Mountains, USA.

Russell Parsons -   Research Ecologist - Missoula Fire Sciences Laboratory

Keith Stockman -   Economist - USFS Rocky Mountain Research Station

Matthew Thompson -   Decision Support/Risk Management, USFS RMRS

Chad Hoffman -   Professor, Colorado State University

Matt Jolly -   Research Ecologist, Missoula Fire Sciences Laboratory

Mitch Burgard -   USFS Wildland Fire Management RD&A

Warren Appelhans -   Assistant Fire Planner, USFS Region 1

Zack Holden -   Scientist, USFS Region 1

Weather, fuel moisture and fire management

Nine Mile RAWS Station, Montana

3334 reporting RAWS stations Aug. 1st 2015

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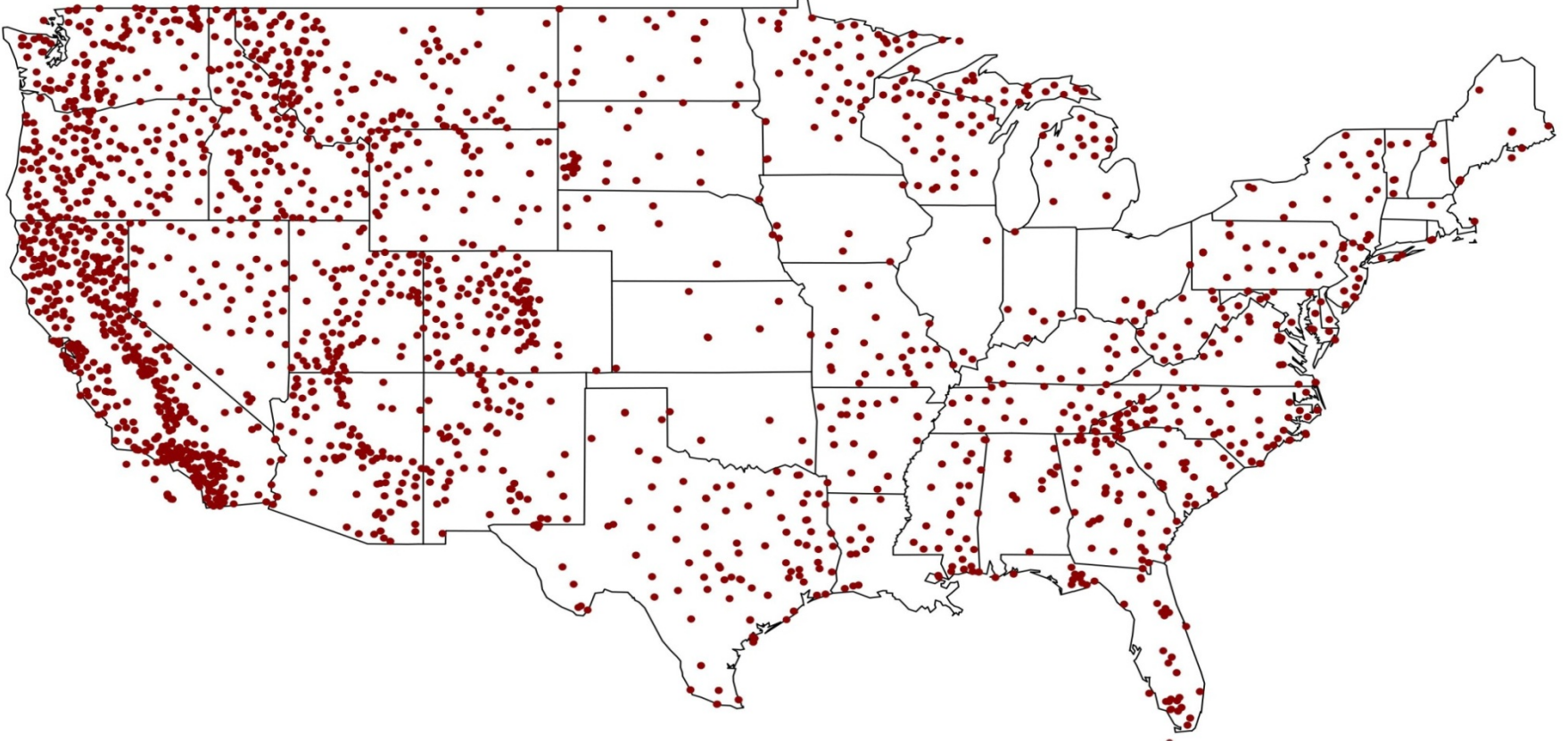
Current fire management DSS depends on RAWS

- Data from nearby RAWS extrapolated to entire landscape
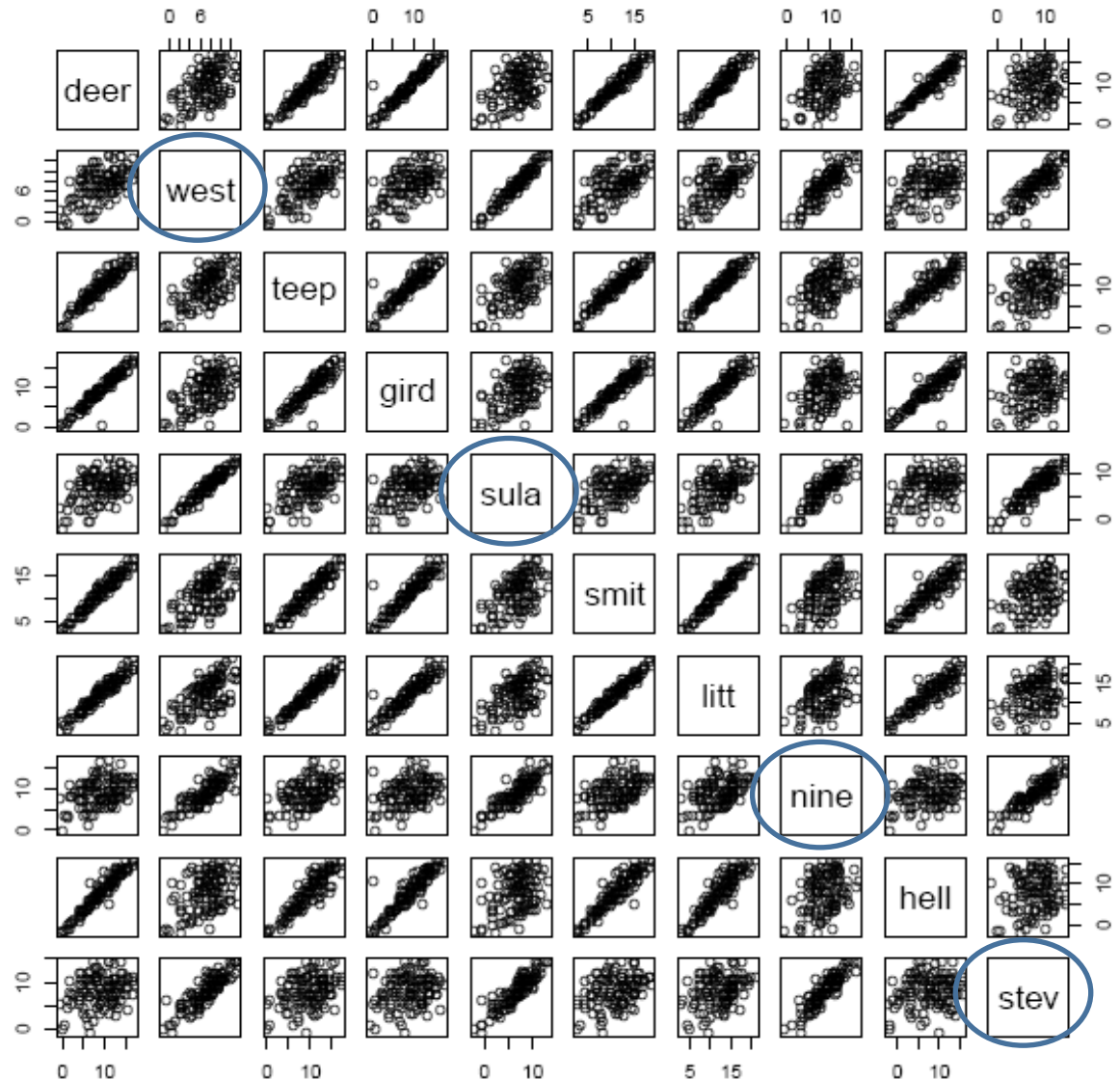- What could possible go wrong?

Nighttime minimum temperature
Decoupling from Free Atmosphere

Correlation Matrix
10 RAWS stations on
The Bitterroot NF

All within 50 mile
Radius

Circled Stations are
At mid-slope or
valley bottom
locations

Wildland Fire Decision Support System (WFDSS)

- Fire Behavior Analyst providing support on an incident

- Local RAWS data from nearest station used to generate gridded weather data for fire behavior simulations (flammap, FARSITE)

- Ignores terrain position of RAWS station and ignores pre-fire conditioning (e.g. snow)

Prescribed fire planning

- RAWS data from nearest station used to estimate whether current weather conditions are within a prescription window

- What if there is snow the north side of the mountain?

2 big challenges

- Challenge 1: translating new data into Rx and wildfire decisions, showing how much they may influence outcomes

- Challenge 2: Quantifying the cost savings or alternative decision outcomes that could result from using this information

The question is not whether gridded data will improve the quality of our information

It's how much

Task 1

how do spatially explicit gridded fire danger maps impact estimates of areas on the landscape that are within prescriptions for prescribed burning? (M. Jolly)

Methods

For a sample of spring dates, use RAWS to quantify areas within burning prescription

Compare with gridded estimates

Translate differences into decision outcomes and potential lost opportunities

Task 2
How do topographically resolved gridded fuel moisture estimates influence modeled fire behavior, and fire spread rates? (Russ Parsons, Chad Hoffman)

Methods

For a sample of fires in the US Northern Rocky Mountains we will quantify modeled fire behavior, rates of spread and size using existing methods, relying on the nearest RAWS and the same fires using improved gridded weather and fuels moisture data.

Wildland Fire Dynamics Simulator
(WFDS; Ruddy Mell)

- **Level Set method**

- Nested models (simple to full physics based)

- Level Set 1 equivalent to FARSITE

- Provides basic spread information equivalent to operational model

A comparison of level set and marker methods for the simulation of wildland fire front propagation

Anthony S. Bova[A], William E. Mell[B,D,E] and Chad M. Hoffman[C]

Fire behavior methods

- Estimate how decision space would be expanded by better information (e.g. presence of natural barriers , i.e. snow)

- use a value of information approach to demonstrate how refined information on fire behavior and opportunities could improve incident decisions

- quantify these improvements using a vector of outcomes that at a minimum will include suppression cost and responder exposure.

Task 3: How much will gridded weather and fire danger improve models of aerial fire retardant success?
(Keith Stockman)

- Aerial fire retardant applications are expensive (>$75,000 per drop)
- sometimes they have no effect at all on fire spread

- Wildland fire managers at the national level have invested in the development of models aimed at predicting whether a proposed retardant drop is likely to be effective

- A logical question is whether gridded weather and fuel moisture data (or drought indices) can improve the accuracy of these models over using local RAWS data alone

Methods

evaluate the potential for gridded weather and fire danger data to improve models aimed at estimating the probability of success for aerial retardant application

Based on higher amounts of explanatory power we will estimate the potential economic benefits of more cost effective retardant delivery using the expected value of perfect information based on real wildfire examples from the 2015 and 2016 seasons.

This change in the quality of information can be directly translated into decision making and cost saving

Questions